

Numerical Solutions for Schrodinger's Equation Particle in a Box with Multiple Internal Barriers

Integration limit: $x_{\max} := 1$ Effective mass: $\mu := 1$ Barrier height: $V_0 := 100$

Potential energy:
$$V(x) := \begin{cases} V_0 & \text{if } (x \geq .185) \cdot (x \leq .215) + (x \geq .385) \cdot (x \leq .415) + (x \geq .585) \cdot (x \leq .615) + (x \geq .785) \cdot (x \leq .815) \\ 0 & \text{otherwise} \end{cases}$$

Numerical integration of Schrodinger's equation:

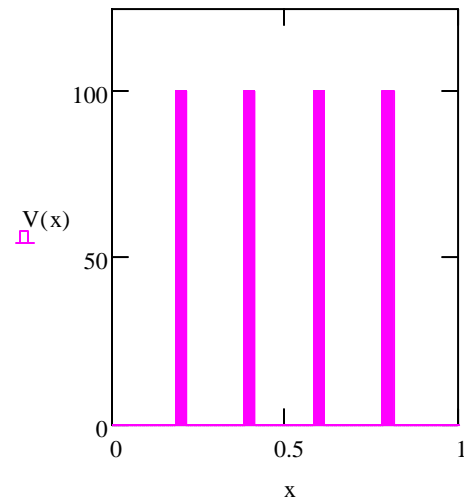
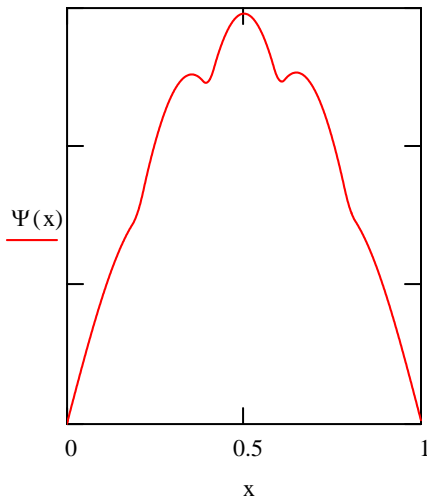
Given
$$\frac{-1}{2 \cdot \mu} \cdot \frac{d^2}{dx^2} \Psi(x) + V(x) \cdot \Psi(x) = E \cdot \Psi(x) \quad \Psi(0) = 0 \quad \Psi'(0) = 0.1$$

$\Psi := \text{Odesolve}(x, x_{\max})$

Normalize wave function:

$$\Psi(x) := \frac{\Psi(x)}{\sqrt{\int_0^{x_{\max}} \Psi(x)^2 dx}}$$

Enter energy guess: $E \equiv 18.85$



Calculate kinetic energy:

$$T := \int_0^1 \Psi(x) \cdot \frac{-1}{2} \cdot \frac{d^2}{dx^2} \Psi(x) dx \quad T = 5.926$$

Calculate potential energy:

$$V := E - T \quad V = 12.924$$

Tunneling probability:

$$\frac{V}{V_0} = 12.924 \%$$